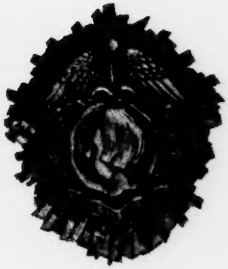
Journal of Dentistry for Children



FOURTH QUARTER 1944

Journal of Dentistry for Children

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The President's Message

The officers of our State Units, I am sure, have been tempted many times to "give up the ship" and place their units on the inactive list until after the war. With the loss of members to the armed forces and with little interest being manifested in dentistry for children at this time, this attitude is natural. The case of the Missouri Unit will serve as an example and I hope that it will be an inspiration to other units.

On June 20th I received from Ralph Erwin, our A.S.D.C. secretary, a copy of a letter from Dr. Florence Rich, secretary of the Missouri Unit. She asked if it might not be advisable for the Missouri Unit to become inactive until after the War. She felt such action was indicated because of decreased membership. In a letter to Dr. Rich I pointed out that "Until the Society can again hold annual meetings we must depend upon the State Units to keep alive the purpose for which the Society was founded. If at all possible, I hope that your unit can continue to function. It is my impression that your unit meets several times a year. Perhaps you could reduce the number of meetings. Even if you find it possible to hold only one meeting a year, I urge you to do this rather than become inactive. Hold the one meeting, elect officers, and keep in touch with the national officers."

On August 14th I received the following letter from Dr. Rich:

"Thank you kindly for your letter concerning the activity of the Missouri Unit.

I am very glad to report that we've had a stimulating change. We had our annual meeting in June—made it a Barbeque Supper to which members, their wives, and a number of guests were invited. We elected Dr. Cornelia Thompson presiding officer, and after a delightful evening and a good business meeting we succeeded in adding four new members and decided to hold 3 meetings next year (2 scientific and 1 business). No reference was made to the effect that the group go into inactive state.

Mention was made of the Mid-Continental Meeting to be held here this Fall and it is even possible that some of our members may even give clinics under the banner of our Society.

So we'll carry on, Dr. Ireland, and we are all hoping for an early Peace and the resumption of normal activity.

Many thanks again for your encouraging letter and we'll do our best."

RALPH L. IRELAND

—What is *your* State Unit doing?

R. L. I.

The Dental Hygienist and Dentistry for Children

JOHN OPPIE MCCALL, D.D.S.
New York, N. Y.

I welcome the opportunity offered me by the newly appointed editor of the Journal to present to those especially interested in dentistry for children my ideas about utilizing dental hygienists in certain phases of operative dentistry for children.

In my writings[1] on this subject so far I have had to curtail my discussion of this particular topic because of its being only a part of the very broad subject of general dental practice. I shall try to explain my proposal more fully in this article.

Perhaps I may most quickly answer questions in the reader's mind by stating first what I do *not* propose to do.

I do not propose to take operative dentistry for children out of the hands of any dentist willing to do it and whose patients' parents are willing to pay him proper fees for the work. I do not propose under any circumstances to have anyone but the dentist treat teeth having pulp involvements, extract teeth or treat malocclusions.

What I do propose is to train and license dental hygienists (perhaps we shall find a better term when the time comes) to prepare and fill cavities that do not involve the pulp, in addition to carrying on their prophylactic and educational work for child patients. They may do this either in school clinics or in the dentist's office, but always under effective dental supervision such as obtains now for oral prophylaxis. Questions at once arise as to why this proposal is made; how the dental hygienist is to be trained for this new function; how illegal practice is to be prevented; what the effect on the dentist's practice will be.

Why is the proposal made? If dentistry for children is worth doing at all it is worth doing well—that is, giving complete dental care of high quality to all throughout the legal period of childhood. As to that point I consider that the legal period of childhood extends up to the eighteenth year. For example, only at that age does the U. S. Army regard males sufficiently matured to induct into military service. Also eighteen is the average age for graduation from high school. Furthermore I include high school children in my plan because I know from experience that caries incidence continues through that period. It is estimated that the population in 1945 below age 20 will be 43,926,000. The population between age 2 and 19 will accordingly be at least 34,000,000. This brings up the question of manpower.

Dollar, in a survey of the future role of dentistry[2] estimated that to start and maintain a dental program for children from 3 through 15 would require the services of 20,000 dentists. To extend this through age 18 would increase this number to at least

1. Dental Practice and Dental Education in the Future; With Consideration of Social and Health Aspects. The Journal of the American Dental Association. Vol. 31, pp. 16-30, January, 1944.
Dental Education in the Future as Influenced by Biologic Concepts. Proceedings of the American Association of Dental Schools. Vol. 21, p. 137, 1944.
Dental Personnel in the Future. Proceedings of the Institute on Dental Health Economics, School of Public Health, University of Michigan, 1944. (To be published)

2. Dollar, M. L. The Present and Probable Future Role of Dentistry in American Society. J.A.D.A. Vol. 30, p. 1460, Sept., 1943.

23,000. This is over a third of the number of peacetime practicing dentists. Stated in another way such a program would require that each practicing dentist would have to devote at least one-third of his productive hours to filling cavities for children. However, shortage of manpower in terms of total practicing dentists is only one phase of the dental caries problem. Experience shows us that an extremely large number of practicing dentists are unwilling to care for children. We cannot expect this condition to change.

But caries is not the only dental problem in childhood. Gingivitis is common and sometimes several treatments are needed for its relief. Accidents occur, especially involving the anterior teeth; the required treatment there ranges from desensitizing in cases with unexposed pulps to pulp canal treatment or extraction and replacement. Malocclusion, ranging from severe malrelations of the jaws to excessive overbite, the latter a serious periodontal hazard, affects about 50 per cent of the child population. Treatment is needed by at least half of these if conditions for optimum health and minimum upkeep cost during adult years is to be attained.

I think it will be clear that in terms of caries alone the manpower problem will be acute if we are to do a real job. And when we add to that the imperative necessity of keeping costs to a minimum consistent with service of high quality, we have an argument for using auxiliary personnel trained to do a special job and that job only, that is difficult to refute.

But we are not thinking of caries alone as has already been stated. Treatment of routine caries (shallow, recently discovered, cavities) by filling operations makes up to 85 to 90 per cent of the treatment needed. I think dental hygienists can be trained for this part of the dental program. The other 10 to 15 per cent consists of treatment of deep caries including cases with pulp involvements, extractions (including occasional removal of supernumerary teeth, cysts, etc.), pulp canal treatment and orthodontic treatment. These treatments will be done by the dentist.

In view of the size of the problem of malocclusion I feel very strongly that the general dental practitioner should be trained to treat most cases. There will still be a field for the specialist in orthodontia to whom the more difficult cases will be referred.

Dental hygienists, in addition to doing the operative work indicated above, would continue to do prophylactic treatment and health education as at present.

How is the dental hygienist to be trained for her work as proposed? First it must be understood that the dental hygienist even in the one-year course given now by most schools receives a thorough grounding in the basic sciences. These include general anatomy, physiology, histology and embryology, pathology, bacteriology, chemistry and nutrition. She has courses in dental anatomy and histology, dental pathology and preventive dentistry. She thus has already a good scientific foundation for a limited course in operative dentistry. Her technic work includes tooth carving and the technic of the prophylactic treatment. This provides excellent introductory operative technic training.

Most of the existing dental hygiene schools are conducted within the framework of a dental college and the instructors are largely drawn from the dental faculty. The instructional staff is thus provided for. In such a set-up the dental hygiene student in the future may be given the same fundamental training in cavity preparation and manipulation of plastic filling materials as is given to dental students and by the same instructors. Appropriate lectures would be given. The students would do their practical work in the college infirmary as the dental students do, being assigned cases within the range of what they are expected to do later on. They would have to measure up to the same standards of skill within their sphere as the dental students.

How will illegal practice be prevented? This will largely be up to the dentist with whom the dental hygienist will be associated if in private practice, or up to the supervisor

if in a clinic. She will not be legalized to conduct independent practice in her own office. The principal deterrent against illegal practice will be the instilling of professional spirit during the course of training. This has worked in dental hygiene since Fones launched it in 1913. In thirty years dental hygienists have vindicated Fones' faith in them. I take my stand by him as to the future in this larger field. However, I do not doubt that the occasional dental hygienist may bootleg some dental service from a hideaway just as some dental technicians now are doing. I do not think the fact that this may occur in a small number of cases should deprive the public of the over-all good to be gained through acceptance of my proposal.

How will this proposal affect the dentists? In the case of the dentist in general practice, trained as I recommend, the opportunities for health service to his patients both in kind and quantity will be greater, hence his income and prestige will both be increased. Let us try to visualize a practice in which a fully trained dental hygienist is being employed. (The dentist will have his own laboratory technician as well and, of course, a well-trained dental assistant; in this office there will be three dental chairs, the third as a time saver in changing patients and for surgery and x-rays.)

The dentist examines the mouth of the child patient and, if there is any evidence of malocclusion, takes impressions for models. The dental hygienist may then take the child to another chair, give him a prophylactic treatment and take x-rays. Before the patient returns for the next sitting the dentist has read the x-rays and examined the casts. At this and subsequent appointments teeth with cavities that may encroach on the pulp are excavated and filled or otherwise treated by the dentist, including extractions if needed. Shallower cavities are later filled by the dental hygienist. When all cavities are filled the dentist begins orthodontic treatment if indicated.

It will be noted that during the treatment of this child the dentist's time has been to a considerable extent freed by delegating the simpler routine operative procedures to the dental hygienist. During those hours he can treat other patients who are in need of more complex procedures. Needless to say he derives an income from both sources. (The laboratory technician will be utilized to make models, space maintainers, orthodontic appliances (if desired) and cast inlays as well as carrying on the laboratory part of the prosthetic work done in the practice. I have discussed the range of prosthetic procedures to be carried on by the laboratory technician in the other writings referred to above.

If the fully trained dental hygienist is used in a school clinic, the dentist's opportunities for satisfaction in his work and in income received will be enhanced in the same proportion as in the office, with the same division of the operations to be performed.

Dental cost to the child will thus be reduced. At the same time, the dentist being even more fully trained than at present will enjoy increased income for the services he himself performs.

By this procedure a much larger number of children will have been served and with more complete care. The dental hygienist, having a dental college course of probably two years, following high school graduation, plus one year of internship (which she will serve in a school or other clinic at subsistence salary), represents a much smaller educational investment than the dentist. For that reason the necessary cost of her services will be well below that of the dentist's costs.

Copper Cement and the Dental Pulp

R. DUANE HAYES, D.D.S.
Nashville, Tenn.

The statement of the chemico-bacterial theory of dental caries created a demand for germicidal properties in filling materials. The manufacturers hastily supplied these materials, primarily in the form of the so-called "copper" cements. These copper cements are, in reality, only zinc phosphate cements with copper added to either the powder or the liquid.* The set cement varies in copper content from 5 to 25 per cent, depending upon the formulas that have been prepared by various manufacturers.

The lavish claims made for these cements as effective filling materials led to controversies between manufacturers. From their investigations, aimed at disproving a rival's claims, came the first laboratory studies of the properties of these cements.

Poetschke[1,2] found that all cements were germicidal when they were first mixed, but he was unable to demonstrate any germicidal properties in any copper cement until the cement was broken down and a washing or solution of it was made. He found also, that the working qualities of the cement depended upon the variations in the technic employed in its mix. When the cements were set, the strongest cements were the most dense and the least permeable to moisture. The density seemed to depend upon the particle size in the set cement, which was somewhat dependent upon the particle size in the powder used. It is interesting to note that one copper cement which was recommended for use in the cavities of the deciduous dentition, even by its name, disintegrated when a Brinnel hardness test was attempted after the cement was "cured" for a few days in saliva.

Fraser[3] reported that all cements were germicidal when first mixed because of the excess acid present at the time of mixing. Crowell[4] showed that the acidity of copper cement was equal to that of silicate cement at the time of mixing, but that it increased in acidity for some time thereafter. Antiseptic properties after setting were ascribed to acid compounds formed with copper in the setting process.

In view of these investigations this material does not seem to be superior to ordinary zinc phosphate cement. It has been recommended for use in teeth with deep caries to sterilize the carious dentin that may be left, and to prevent the recurrence of caries. Obviously, if the material is strong enough to serve as a part of a restoration, then it is of no value as a germicide. If the material breaks down into a solution so that it can act as a germicide, then it cannot remain in the tooth to act as part of the restoration. The possible effects of the acidity of these cements on the pulp also deserves consideration.

Boedecker and Applebaum[5] have shown that the pulp and dentin react to every filling that is placed. They also showed that salts of the filling material penetrated the tubules of the dentin. On the basis of these observations they urged that the pulp be protected from all filling materials by the use of varnish or other sealing agent. Dixon[6] confirmed their findings, although he disagreed with some of the details.

Pulpal reaction to various filling materials, operative procedures, and saliva have been studied in the teeth of young dogs by

*"Black copper cement," which is 95% copper is not included in this designation, since it is in no sense comparable.

Manley[7,8] and others[9,10,11]. Results were so uniform that some quantitative statements can be made from these studies. In every case copper cement produced the greatest reaction.

Since caries, saliva, and even operative procedures may produce a pulpal reaction, it would be interesting to compare the effects of various filling materials upon the pulps of teeth which have been affected by caries and those not previously affected. No doubt the previously-erected barrier would retard the irritation, thereby decreasing the pulpal reaction. Such a study hardly could modify the implications of the work already done, however, because of the few instances in which a noncarious pulpal surface is not involved or produced by the necessary extension during operative procedures. If new surfaces are produced they must be sealed from the irritation of the material used in the restoration.

Since copper cement has no physical properties which are superior to other cements and since its chemical properties appear to produce the most markedly degenerative pulpal reaction of any material tested so far experimentally, its use as a dental material appears difficult to justify.

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Q.—*Will an abscessed primary tooth cause injury to the enamel of the permanent successor?*

A.—"Occasionally hypoplastic enamel is observed that is confined to single teeth, especially bicuspids. The affected teeth, known as Turner teeth, have small brown, irregularly shaped crowns; the enamel may be entirely lacking or may be present in zones or islands in some portions of the crown. Obviously this form of hypoplasia cannot be caused by a systemic disease or deficiency, for if it were, other teeth would also be affected. The cause of enamel hypoplasia on single teeth is infection and apical inflamation of the preceding deciduous teeth."

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Dentistry's Obligation to Society — Has It Been Met with Reference to Pedodontics?

LT. COLONEL JOHN C. BRAUER, D.C.

Dentistry has obligated itself to society in that it has been designated and delegated as a profession to preserve the health and functional integrity of the oral structures. Federal and state laws are in evidence to indicate that the profession has been given certain rights, privileges, as well as protection and it is for this reason that the practitioners of dentistry are in a large measure answerable to the people. *How well has the profession of dentistry maintained this trust and responsibility with reference to children?*

It must be admitted that the majority of children have not had the advantages which modern dentistry affords today. This fact may be visualized by reviewing the results of almost any county dental school inspection, or the dental records of the inductees of World War II.

The realization that American dentistry had accomplished only a small part of its intended function in society, was made clear to the nation in the high percentage of rejections during the early part of World War II. The Selective Service data reveals that of the first three million registrants examined by the local and induction boards, from November, 1940 to September, 1941, dental defects were the primary cause for rejection in 8.8 per cent of the selectees[1]. This meant that about nine out of every 100 men between the ages of twenty-one and thirty-six years inclusive did not meet the minimum dental standards as required by the Army. These minimum requirements consisted of six masticating teeth, three upper and lower bicuspids or molars opposing each other in functional occlusion, and six incisor teeth, namely three uppers and three lowers. Those teeth which had been restored by crowns or replaced by pontics attached to bridgework were considered natural and serviceable. A tooth was not considered serviceable if it was involved with a known root end infection or advanced pyorrhea. Serious diseases of the jaw or marked malocclusion were also causes for rejection. These deficiencies, preventable in all but the exceptional individual, created a rehabilitation problem in the Army unparalleled in the history of dentistry or military science.

Records reveal that after the dental standards for induction were reduced, about one inductee in every four required emergency dental treatment, and that subsequent to the corrective program approximately fifteen per cent of the soldiers wore one or more dentures[2,3]. An analysis of 107,542 denture patients showed that 13.5 per cent were between eighteen and twenty years of age inclusive, and that 8.3 per cent of this total number (107,542) were wearing full upper and lower dentures.[4]

There are several reasons why these adverse dental conditions prevailed, such as, the low income of some of the families, lack of parental education and interest, faulty health educational techniques in the grades and high schools, failure to present an adequate course in dentistry for children in some of the dental schools, and the lack of interest on the part of many practitioners because pedodontics did not offer the same financial rewards as adult dentistry, as well as the fact that some of the dentists did not understand the problems associated with a successful practice of dentistry for children.

Dentistry's future must be built around the child patient. The profession has no other alternative if the dental health of the nation is to be improved, and if dentistry is to assume its rightful place as a truly great health service. This nation cannot afford another military handicap in the generation that is now growing up and those that are to follow. The dentist is morally and professionally obligated to stimulate dental health educational programs, to become thoroughly familiar with the variations and problems in the growth and development as associated with the hard and soft structures of the oral cavity, to study child management, to recognize the economic factors as related to the practice of pedodontics, to know and be able to execute the variations in operative techniques as applied to the child, and to practice the accepted principles of preventive dentistry.

It must be recognized that the procedures and techniques for the child patient in many instances differ greatly from the mature individuals, and that one may conduct a highly successful adult practice yet be a complete failure in dentistry for children. The questions of when to restore a carious primary tooth, when to extract or when not to extract a given tooth, when to advise a space maintainer or when to advise orthodontic treatment are but a few of the multiple problems which are definitely not routine in an adult practice. Then there are the procedures associated with pulp management, and the fractured anteriors in the young patient which are not commonly employed in the adult. In addition, all of the operative and diagnostic problems for the child are directly associated with the important factors of chronological and physiological (dental) age levels. There are no two children alike, and their variations in growth and development calls for many diagnostic principles in addition to those employed for the parent. The dentist who is not cognizant of these differences is living in a false sense of security and the future for him in pedodontics definitely is limited.

The practitioner whose primary and only interest is the adult patient cannot be considered a general practitioner, for he is in reality limiting his practice. Such a specialization or limited interest does not permit him to accept or qualify in the great responsibilities incident to the treatment of the child patient. The children of America have too great a future and too great a place in the coming world history to warrant any mismanagement, disinterest, and secondary place in anyone's practice. The dentist who is specializing in adults and not conducting a general practice, should have courage enough not to accept the child patient, but direct this potential leader of tomorrow to an office that is vitally interested in the diagnostic variations and operative techniques of the growing child. The adult specialist who accepts the child patient, just to retain the parents, without giving the young boy or girl a completed dental service, is violating the trust which has been bestowed upon him by society and the profession.

The specialist for adults, who has not yet accepted his full responsibilities as related to the child patient, may again become a general practitioner in the truest sense by an adjustment in his sense of values, and by becoming familiar with the great and actual dental needs of the citizens in his community. Dentistry for children has been found to be most interesting as well as profitable in the average dental office, when the problems and economical consideration pertaining to the child have been approached intelligently.

Dental Needs for the Average Child

PRESCHOOL—There are about 2,500,000 children born each year in the United States, and approximately one-half of these will require some dental service between their second and third birthday. McCall[5] states, that about fifty percent of the children at two years of age examined at the Murry and Leonie Guggenheim Dental Clinic had one or more decayed primary teeth. He further said that more than thirty per cent of the two-year-old patients have seven or more cavities, and that nearly one out of every four children at this age required at least one extraction. Sixty per cent of the five-year-old children examined had seven or more teeth

with cavities and one or more teeth which needed extraction.[6]

A summary was made of the average incidence of dental caries in the preschool groups from the reports of several studies in various sections of the United States including those at the University of Iowa.* These studies which represent about 7,000 children show that the average child has the following number of cavities:

Two years	1.13 cavities
Three years	2.67 cavities
Four years	3.97 cavities
Five years	4.05 cavities

Additional data representing well defined examination procedures will have to be completed in various sections of the country before accurate dental caries incidence tables and increment rates can be established for these age levels.

O'Rourke, former Dean, School of Dentistry, University of Louisville, indicates that in 1940, there were approximately 10,500,000 children in the United States under the age of five years, and that there were about 21,000,000 children nine years and below.[7]

There was about twenty-five per cent of the population, or about 33,000,000 individuals, fourteen years of age and under in this country.

This great group of 10,500,000 children under five years of age presents a tremendous challenge to American dentistry and ingenuity. If this preschool age level could receive complete dental treatment as well as a continued maintenance service thereafter, and then gradually add to this group the two or more million children who annually become two years of age, the people of America and the armed forces of the United States would visualize comparatively few dental cripples at the age of twenty, thirty or the years beyond. The dental "have nots" will always be with this nation unless some comparable program is initiated or unless dental caries and infection can be eliminated through preventive measures other than operative procedures.

*Unpublished data.

GRADE AND HIGH SCHOOL — It is estimated by Klein of the United States Public Health Service that the average individual between the ages of six and twenty will require about one filling each year, and that the accumulated needs of this age group are about seven fillings per person.[8] He further said that the dental needs developed at nearly the same rate regardless of the socio-economic status of the various segments of the population, and that children of this study received only about one-fifth of the fillings actually required. The average permanent tooth mortality according to Klein[9] is about 0.03 at the age of seven, 0.29 at the age of ten, 1.07 at the age of fifteen, five at the age of twenty-eight, fourteen at the age of forty-two, and twenty-three at the age of seventy.

The incidence of loss of the first permanent molar is reported by Strusser,[10] who says that at the age of eight 1.2 per cent of the children have one or more missing teeth, while at age nine 3.8 per cent have one or more missing molars. He found that in 913 children examined at six years of age, 20.4 per cent had one or more decayed, missing or filled (plus one or more decayed) first permanent molars.

The Economics Committee of the American Dental Association in a study conducted during May, 1940, of a select group of 313 male patients going to dental offices, between the ages of fifteen and nineteen years, inclusive, stated that 7.0 fillings were necessary for the average individual.[11] The following dental services were also found essential in an examination of 414 individuals in this same age bracket: 0.1 crowns, 0.9 extractions, and 0.1 removal of impactions. The study further indicated that 18.1 per cent of the individuals in this age group required fixed bridges, 2.0 per cent removable bridges, 4.5 per cent partial dentures, 1.6 per cent full upper dentures, 0.6 per cent full lower dentures, 77.0 per cent prophylaxis, 5.4 per cent root canal therapy, and 2.9 per cent required pyorrhea treatments.

Although the study conducted by the economics committee is a select and relatively

small group it does indicate the tremendous needs that accrue in individuals before the age of twenty. If a comparable or larger sample were taken from those young men and women who do not seek dental service an even greater need would in all probability be recorded.

CONCLUSIONS — One can visualize, when the preceding data are reviewed, what a tremendous task and obligation dentistry has accepted, and further what a challenge has been directed to those who have carried the banner of dentistry for children. That the American Society of Dentistry for Children has accepted this challenge, and has been the principal agency in stimulating the profession to be of greater service to humanity, can be attested to by all those who read the literature and who attend professional meetings. That some dental educators have recognized their full responsibility to society and to the nation they serve, is known by the fact that such schools have given pedodontics a place of importance equal to that of any other major subject in the curriculum. Dentistry for children cannot be taught adequately in any school on a part-time basis, or by an instructor whose primary interest is in some other field. Pedodontics has been given a second or third rate place in the curriculum too long in some dental schools. The graduates from such institutions have been given a tremendous handicap, and the children they serve or should serve, will not be afforded the privileges of modern dentistry. Unless all of the dental schools are willing to carry their full responsibility, the children of today will find themselves as adults with many of the same gross dental deficiencies which are now evident at every induction center. Many dentists, after graduation, throughout the country, have become excellent operators and diagnosticians in dentistry for children in spite of the fact the faculty which taught them were subordinating pedodontics. The American Society of Dentistry for Children can take much credit for assisting the progressive practitioner in post-graduate education.

It is believed that all schools will soon emphasize pedodontics to such a degree that every graduate will feel competent to fulfill his obligation to society and to the community in which he is privileged to practice. The practice of dentistry is destined for a new era; namely, a major emphasis on dentistry for children. This obligation, with which every general practitioner is charged, can no longer be ignored, forgotten, or practiced by a few. The profession of dentistry cannot take all the blame for the deplorable state of dental health seen at the induction centers, but there is sufficient evidence to indicate clearly that part of the fault lies with the interest that education has had in this all important phase of dentistry.

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The Tooth Positioner as the Means of Final Positioning of Teeth to a Predetermined Pattern

HAROLD D. KESLING, M.D.S., D.D.S.
LaPorte, Indiana

This new technique of final positioning of teeth grew out of a desire to create some simple appliance that would influence all the teeth to flow into their best possible positions with relation to one another without any interference from bands or wires; an appliance that would be especially effective under functional forces; an appliance that would produce arch form in accordance with type; an appliance that would further attain the desired harmony between facial features and tooth arrangement; and an appliance that would serve as a retainer to conserve all the advantages gained by the above. Examination of the results of a cross-section of present day orthodontics would reveal a marked need for such an appliance. In general, orthodontists have been depending upon Nature to do this final positioning. In too many cases this resulted in disappointment.

Harold D. Kesling graduated from the Chicago College of Dental Surgery in 1924, and in 1933 received the Master's degree in Orthodontics from the same school. He is a member of the Edward H. Angle Society of Orthodontics, as well as the local, state and national dental associations.

As an avocation, he plans and constructs stone buildings, and his office and home attest to his ability on that score. Dr. Kesling has a fourteen year old son, who at times needs his Dad's assistance in the operation of a farm, fifty acres of which is planted in popcorn.

It would be ideal if all tooth movements could be accomplished with an appliance that did not in itself interfere with proximal contacts, nor increase the arch lengths by the thickness of the bands which are used to control the teeth. To date, it is necessary to use this conventional type of appliance for major tooth movements. In the average case these major tooth movements can be accomplished in a comparatively short time. This is especially true when the operator is not compelled to do the final tooth positioning with this conventional type of appliance. With this new technique it is possible to do the final artistic tooth positioning without interference of bands or wires.

Conventional types of appliances have failed to utilize functional forces. Not infrequently these appliances even go contrary to these functional forces rather than taking advantage of them to facilitate tooth movements.

Every orthodontist has hoped to develop for each of his patients an arch form according to type. In the main this has failed, because, in a high percentage of the cases treated, arch forms have been produced that would allow the teeth to assume positions which would least resist the desired tooth movements. Thus, arch form came to be a result of expediency rather than a development according to type. In fairness, we must give credit to the rare orthodontist who, painstakingly and laboriously, develops each arch form in accordance with type,

after major tooth movements have been accomplished.

Slight changes in any denture are inevitable, and a retainer that would accomodate itself to these changes is desirable. Conventional retainers are rigid and do not allow for this inevitable settling of the teeth. The most desirable retainer would be one that would be flexible enough to allow for the settling but would function even though there has been a slight relapse. With these things in mind the tooth positioning appliance was developed.

If we are to influence teeth to their best possible positions, we must know what those positions are. This necessitates a predetermined pattern for each case. Each predetermined pattern is developed by dissecting the plaster teeth from a model of a case that has had proper basic treatment completed. These individual plaster teeth are carved in such a way that they can be repositioned on the cast, in wax, to the desired arch form, axial positioning, and occlusion. This gives the operator an opportunity of expressing himself as to the desired arch form and final arrangement of teeth which he wishes to produce for any particular individual. The set-up is completed by waxing around the teeth in such a way as to reproduce the normal contour of the gum tissue.

Invariably an operator first attempting to make a set-up finds it very difficult to finish it to his satisfaction. He becomes very conscious of tooth anatomy, arch form, and axial positioning. It is only with experience that an operator develops ease in positioning the plaster teeth to his satisfaction in a reasonable length of time. One thing that is obvious to every orthodontist making these set-ups is that there are many cases where there is more tooth structure than there is basal bone to support it. This diagnostic value of the set-up might well be applied before basic treatment is initiated. It offers conviction to any doubtful person that frequently there exists a discrepancy between tooth structure and basal bone. The real value of the set-up, however, lies in the fact that the teeth in the mouth are influenced toward this ideal arrangement by the tooth positioning appliance.

The tooth positioning appliance is a one-piece, pliable, rubber appliance which is constructed to fit perfectly over the teeth of the set-up models of the predetermined pattern. It completely fills the free-way space as these models are articulated in the physiological rest position, and besides covering both the maxillary and mandibular teeth, the appliance extends about three or four millimeters onto the gingival tissues.

As the patient closes into the positioner each tooth is forced into its respective socket. This is possible because the appliance is elastic and stretches over the irregularities. The resiliency of the material tends to influence the teeth to assume the positions of those in the predetermined pattern. To be most effective it is necessary that the patient exert pressure by bringing the muscles of mastication into play. At first these muscles will fatigue in a very short time, but as the patient wears the positioner, the muscles will develop, and the patient will no longer tire from this action. When the positioner is first introduced to the patient, he must wear it some of his waking hours as well as at night while sleeping.

The appliance differs from any others in that it is most effective under functional forces. When the appliance is properly worn, the muscles of mastication and expression are under tension, and the stimulus of this action is very desirable for both the gingival and supporting tissues of the teeth. Due to the functional forces at work this appliance is most effective for depressing teeth, such as the anterior teeth in an extreme closed bite, and the posteriors in an extreme open bite. No other appliance, in fact, affords such an excellent force for depressing teeth.

By using this new technique of final positioning of the teeth, it is possible to remove the conventional type of appliance from four to six months earlier than is practical under the usual form of treatment. This is possible because the positioner is a very effective appliance for the final detailed adjustment of

the teeth of any case under orthodontic treatment. When the positioner is properly worn each tooth is being forced towards its best possible position, not only in relation to the teeth of its own arch, but also in relation to the teeth of the opposite arch. Slight spaces are closed, moderate rotations are adjusted, maxillary and mandibular discrepancies are corrected, and proper interdigitation of the uppers and lowers is accomplished. Axial positioning is changed, not only by the pressures exerted on the buccal, lingual, and labial surfaces of the teeth, but also by the functional forces exerting pressure on the occlusal surfaces of the teeth. This is especially true of the posterior teeth.

The positioner itself has a cleansing and massaging action on the teeth and gingival tissues. This is more evident during waking hours when the patient is bringing the muscles of mastication and expression into action. Of the many cases treated with this appliance, all have had healthy gums after a few weeks' wearing of the positioner. In many of these cases hypertrophied gum tissue was noticeable at the end of basic treatment. To date, there is no way of measuring the effect of this stimulus upon the supporting tissues of the teeth. We are quite sure that the forces brought to play are more nearly the normal functional forces than any that have been active under any orthodontic appliance heretofore offered to the profession.

When the positioner is being worn, it automatically corrects most habits that might lead to malposition of the teeth, or retard the adjustments of malocclusion. Mouth breathing, tongue thrusting, thumb sucking, finger sucking or biting, and other similar habits cannot be practiced while the positioner is in place. Irregularities resulting from abnormal positions of the tongue when the patient suffers from perverted swallowing habits are prevented, because the tongue is forced to remain in its normal position while the positioner is being worn. Posture habits about the face are not prevented by the positioner, but at least when they are exercised, the teeth are supported so as to prevent serious malformations resulting.

The day of prolonged wearing of orthodontic appliances is past. The major tooth movements necessary to properly accomplish the basic treatment of any case of orthodontia can be completed in about twelve months, if the active treatment is undertaken at the most opportune time. Many cases can have the bands on and off in six to eight months. This is assuming that the final positioning is to be accomplished, not by bands and wires, but with the tooth positioning appliance.

The appliance that is most comfortable to the patient while offering the least irritation to the teeth and supporting tissues for the shortest period of time should be the ultimate objective of every orthodontist, providing this mechanism produces a satisfactory result. The tooth positioning appliance has made it possible to remove the bands and wires at least four to six months earlier than was practical with the conventional type of appliance. This reduction of chair time is valuable to the orthodontist, and the reduction of irritation to the patient cannot be overemphasized.

Without exception the operators who have completed their basic treatment properly, mastered the technique of the set-up, and applied the positioner intelligently are showing beautiful results. If the individual teeth have sufficient space in the arches, the positioner influences the teeth to flow into a harmonious and natural alignment as conceived in the predetermined pattern. The pressure on any individual tooth is very mild but influences it only in the desired direction. Each tooth becomes an anchor tooth to every other tooth in the arches. Many cases so treated have shown upon examination of the models that the teeth of the individual have assumed the arch form, axial positioning, tooth alignment, and occulsion expressed in the predetermined pattern, that is, the set-up.

Too much stress can not be placed upon the fact that cases MUST have proper basic treatment before the positioner is introduced. It would be too much to expect to make major tooth movements, or intermaxillary adjustments, with this finishing appliance. Its proven value is as a *finishing* appliance and retainer.

EDITO

DENTAL CARIES CONTROL

There are several states that have inaugurated a laboratory service for dentists through the schools of dentistry or state health departments in the past few years that are destined to play an important role in a program of dental caries control. Research groups are agreed that the saliva test is an authentic diagnostic procedure to indicate dental caries activity. Methods of periodic dietary control for caries-susceptible individuals have been established and successfully applied especially to patients with rampant dental caries. Highly susceptible children and adults need no longer be a problem to the dentist.

It has been stated rather recently that we should wait for a more thorough understanding as to the cause and control of caries before an attempt is made to carry out a caries control program. However, many control programs in other health fields have been and still are effective without complete knowledge of the disease.

Control of dental caries in susceptible cooperative individuals can be assured and should become a part of a complete dental service to those patients. The work and cost involved in the restoration of a carious mouth deserves a follow up preventive program to protect the teeth against more caries, which is a protection to the patient and the restorative work.

We have reason to believe that many persons would rather have dental caries than to curtail the use of certain desserts, candies, and soft drinks for indefinite periods of time. However, Dr. Philip Jay, Director, Dental Caries Research Laboratory, School of Dentistry of the University of Michigan, has demonstrated that susceptible individuals can be placed on low carbohydrate diets for two weeks and then may add starches to the diet for a second two week period. At the end of four weeks if the Lactobacillus count of the saliva is favorable the patient may have a dessert a day added to the diet for an additional two week period. In most instances the patient may return to an unrestricted diet for an indefinite period of six months to a year or more. Periodic saliva analysis once or twice a year would determine whether or not a restriction of carbohydrates in the diet is necessary.

ORIAL

Demonstration of this caries control program has been in progress for several years by individual dentists throughout the United States and has proved successful for a good percentage of patients. Programs on a community and statewide basis are more recent, and their degree of success depends upon the practicing dentists.

The dental profession has been reticent about making a charge for consultation services but will have to plan a fee for this service on the preventive program or it will fail. Many parents are willing to pay for a preventive service, especially at this time. The average parent of a child with carious primary teeth is apt to ask if anything can be done to prevent the same difficulty in the second teeth and in most instances will attempt to cooperate in a control program.

The members of the American Society of Dentistry for Children have proved themselves able as individuals and as a group to organize and to promote the better interests of dentistry for children. Our group might well attempt to acquaint itself, as well as the dental profession, with a truly preventive dental service and to promote its use.

C. RAY TAYLOR

Two other demonstration dental caries control programs inaugurated this fall which will be of interest to members of the A.S.D.C. are studies in New York State and in Michigan. Since communities with water supplies containing about 1.0 p.p.m. of fluorine show a significantly lower caries rate than communities with fluoride deficient water supplies, the above states have undertaken a project to add 1.0 p.p.m. of sodium fluoride to the municipal water supply in two communities to ascertain the benefits. In New York, Newbergh is the study city and Kingston is to be the control city. In Michigan, Grand Rapids is the study city and Muskegon is to be the control city. The "base line" clinically and bacteriologically is about complete, and fluorination of the Newbergh and Grand Rapids municipal water supplies is anticipated sometime this Fall.

A. E. S.

The Full Cast Space Maintainer with a Simplified Waxing Technique

ROBERT N. MENDENHALL, B.S., D.D.S.
University of Nebraska College of Dentistry

Full cast space maintainers were first conceived and advocated by Willett. The overlay used for abutments for this particular type space maintainer is called the Willett overlay and was originally recommended by him for orthodontic anchorage instead of the molar anchor band.

When a space maintainer is placed in a child's mouth it is usually necessary that it remain in place for two, three or more years. For this reason the Willett crown is especially adaptable for space maintainer abutments since it provides rigid anchorage, is not easily displaced, and minimizes the chance for the occurrence of caries in the abutment teeth.

The space maintainer construction described is for one extending from the second primary molar to the primary cuspid and may be modified to suit the individual case. You will note this space maintainer is not rigid but has a sleeve-lug attachment on the molar casting. Since the lateral growth in the cuspid region is greater than in the molar region, this type attachment permits normal growth and development of the jaw while preventing the collapse of the posterior portion.

Robert Mendenhall is a graduate of University of Nebraska, School of Dentistry, and is now associated with A.S.D.C. President Ralph Ireland at that school. Dr. Mendenhall is a member of Omicron Kappa Upsilon and was the recipient of the Certificate of Merit of the American Society of Dentistry for Children upon his graduation.

MATERIALS NECESSARY

1. Sectional crown and bridge impression trays.
2. Red cake compound.
3. Base plate wax.
4. Low fusing impression wax.
5. Pencil with cylindrical rubber eraser.
6. 28 or 30 gauge sheet casting wax.
7. 14 guage round sprue wax.
8. Hinge articulator.
9. 13 gauge round metal wire.

CHAIR PROCEDURE

1. Reduce all undercuts present on the teeth to be used as abutments.
2. In a crown and bridge tray take a compound impression of the area including both abutment teeth.
3. Remove impression, dry, and coat the inside of the impression with low fusing impression wax which has been warmed in a water bath till liquid. This coating should be about 1 m.m. thick.
4. Re-seat the impression in the mouth under firm pressure for three to four minutes, chill with cold water and remove. This gives accuracy and detail necessary for a casting. Pour impression in casting investment.
5. In a crown and bridge tray take a compound impression of the opposing area and pour in plaster.
6. A wax occlusal bite should be taken and the models mounted on a hinge articulator.

LABORATORY AND WAXING TECHNIQUE

Waxing the Molar

1. Cut a piece of 30 gauge sheet casting wax in the form of an one inch square. Starting in the lower left hand corner of

this square make a circular cut ending in the lower right hand corner, the greatest depth of this cut into the square being about one-fourth inch. This piece of wax approximating one quarter of a circle is removed and discarded.

2 At right angles to the circular cut make two parallel cuts extending to the top of the square and each equi-distant from the right and left sides respectively. These cuts are started one-fourth of an inch above the highest point of the circular cut. The strip of wax thus secured should approximate the width of the occlusal surface of the second primary molar.

3. The curved edge of the square readily fits over the inter-dental septum and is placed on the distal of the second primary molar. Holding the wax on the buccal and lingual with the thumb and index finger the strip secured in step No. 2 is brought down over the occlusal and mesial surfaces. The buccal and lingual flaps of wax are adapted to the buccal and lingual surfaces by rolling a cylindrical shaped eraser over the surface of the wax. This is a rapid and accurate method of adapting the wax. This forces the wax against the cast and maintains an even thickness all over. The occlusal surface is adapted with the same rolling motion using the edge of the eraser.

4. The excess wax is trimmed to within 1 m.m. of the gingival line, and this excess is then turned up leaving the finishing line at the gingival. This extra thickness of wax prevents an irregular gingival margin in the casting and gives added thickness for polishing and finishing. By leaving the tips of the cusps uncovered, very little "spotting" of the finished overlay in the mouth is necessary.

5 On the mesial contact point a bead of wax is added. Through this bead of wax a hole is made with a warm piece of 13 gauge round wire.

Waxing the Cuspid

1. Again a one inch square of 30 gauge sheet wax is used. Starting in the lower left hand corner of the square make an eliptical cut ending in the lower right hand corner, the greatest depth of the cut being about three-eighths of an inch. This piece of wax approximating one-half of an elipse is removed and discarded.

2. At a right angle to the eliptical cut a single cut is made equidistant from the right and left sides of the square. This cut, as before, is started one-fourth of an inch above the highest point of the eliptical cut and carried to the top of the square.

3. The curved edge of the square is placed over the interdental septum on the mesial of the cuspid, and the buccal and lingual flaps are adapted with the cylindrical eraser. The excess wax is trimmed to the gingival line and the wax over the incisal tip of the cusp is removed.

4. A piece of 14 gauge round sprue wax is bent to a right angle. The bent end is placed in the hole of the wax bead on the mesial of the molar. The straight end is waxed rigidly to the cuspid at the contact point. This arm between the cuspid and molar should be placed into "light" occlusion with the teeth of the opposing arch.

Investing and Casting

1. The cast is now removed from the articulator and cut into two pieces so that the molar overlay and the cuspid overlay with its arm may be cast separately. The cut is made with a knife or thin bladed saw midway between the cuspid and molar. Great care should be exercised in this cutting to prevent bending or distortion of the arm attached to the cuspid.

2. It is advisable to use two 14 gauge sprues for each casting to insure a good, dense and complete casting.

3. Cleanse surface of the wax thoroughly with tincture of green soap or a soap solution such as Aersol.

4. Carefully paint a medium thick mix of investment on the wax with a fine camel's hair brush, forming an inner core, and allow investment to set.

AROUND THE COUNTRY—

The writer had the pleasure of living with Dr. J. G. Williams, from Atlanta, Georgia, at the P. H. Institute in Ann Arbor. "J. G." has done a marvelous piece of work with children's dental programs in Georgia. He is a director, dental division, Department of Health, Georgia; also a practicing dentist in Atlanta, and President of the American Public Health Dental Association. A busy "little" fellow with only two worries at any one time when in normal stride!

California Charlie Sweet—we missed you at the Ann Arbor Institute. We all remember Charlie as the fellow who originated the "Contract Plan" for children's dentistry.

'Tis good news indeed that an old friend of Walter McBride, John Clayton of Kansas City, has been elected President of the Missouri State Dental Society. Dentistry for children should make headway in Missouri.

Recently appointed as Dean of the College of Dentistry, University of Louisville, is Dr. Phil Blackerby, formerly dental director for the State of Tennessee. Phil made many friends in Michigan during his post graduate studies at Ann Arbor several years ago, and we all wish him well in his new position.

Frank Cady, recently transferred to Chicago from Lexington, Ky., has been assigned to the staff of the U. N. R. R. A., in charge of dental relief. He has received his orders for overseas duty and hopes to be able to meet up with his son, who has been over for several months.

Sewell S. Milliken is now an Ensign stationed somewhere in England. Sewell is the young man who was helping Dr. Phil Woods put over a dental program for the Farm Security Administration. His home office is in Milwaukee. Dr. Phil Woods is wearing a Public Health uniform and is working with the Farm Security Administration out of Washington. Phil was the first dentist to fill the chair of Dental Director, State Health Department of Maine. Dr. A. H. Garcelon has been selected to fill Phil's old position in Maine.

Another new appointment is Dr. W. H. Rumbel as Dental Director for the State of West Virginia.

Speaking of Jack Pelton's "uniform" being able to attract members (of the opposite sex) for the Public Health Association, let me tell you that Jack's Secretary (Mrs. Jack) needs no help from any husband in uniform to attract attention! I suggest they publish *Mrs.* Pelton's picture, too! The Pelton's present address is Sheepshead Bay, Brooklyn 29, New York, U. S. Public Health Service Hospital.

Our glabrous friend and Editorial Board associate, Jim Gasaway, has sold his home in Detroit and moved to Croswell, Mich., where he plans to lead the "simple" life. Jim will be transferred to the Children's Fund of Michigan program in Sanilac County about November 1st.

John Brauer, now of the Surgeon General's staff, appeared before the Military Surgeons' meeting in New York recently, to read a paper, "Rehabilitation of Men by the Army Dental Corps." Although John is perforce working at present outside Pedodontics, his thoughts are still in that field—and his

article in this issue of our Journal is definitely thought-provoking.

Dr. Leon R. Kramer reports a most successful large rural school dental health program. For the years 1942-43 a 100 per cent correction achievement is reported, with 30 children under orthodontic treatment. The children serviced were from the first grade through the eighth involving slightly less than 400 youngsters.

If there is NO news from your State it is because YOU neglected to send it to this Department. Why don't YOU send us some news RIGHT NOW?

The first School of Public Health west of the Mississippi has been established on the Berkeley campus of the University of California, it is announced by President Robert G. Sproul. Dr. Walter H. Brown is acting dean. No special announcement has been made regarding the field of Public Health Dentistry.

Dr. Ed Short, Dental Surgeon, National Institute of Health, U. S. Public Health Service, has reported in Grand Rapids and will be in charge of the clinical examinations of some 15,000 children. Three other dental officers will report to assist Dr. Short about October 9.

Our prexy, Ralph Ireland, was recently awarded the degree of Master of Science by his Alma Mater, the University of Nebraska. The Zips have done pretty well out there this year, haven't they, Ralph?

C. Ray Taylor, of the Michigan Department of Health, attended the meetings of the American Association of Public Health Dentists at New York, October 2, 3, 4, 5. On the fun side of the ledger, Ray maintains that the night clubs of Milwaukee can't be beat—especially with a guide like R. H. McBride, of Denver, Colo.

Another McBride, Walter of Detroit, attended the A. D. A. meeting in Chicago, October 16, 17, 18. About the night clubs of Chicago, Walter had little to admit, but our roving reporter informed us that Mac and Bill Davis were seen quite frequently in the Dairy Bar of the Bovine House, celebrating something or another!!

Frank Lamons has taken on another responsibility — this one the chairmanship of the Georgia Dental Association. Frank is preparing an editorial on dental education for our next issue, and promises it to be a forthright discourse on that subject.

Our Asheville "amen-er" Walter MacFall, reports that he has been too busy with his Victory garden and his Sunday School class to send in any news about his section of the country, but that he'll have something for our next issue.

This column is conducted by Stanley C. Brown. Please direct items of interest to him at Ithaca, Michigan.

Growth and Development Factors in Orthodontic Treatment

HERSCHEL H. REYNOLDS, D.D.S.
Detroit, Mich.

It was Dr. Edward H. Angle who first formulated a principle upon which the science of Orthodontics is based. This principle or law is known as the Line of Occlusion. It is defined as the line with which, in form and position, according to type, the teeth must be in harmony if in normal occlusion. The requirements necessary to fulfill this law are as follows:

1. A full complement of teeth, and each tooth must be made to occupy its normal position.
2. There must be a normal cusp and occlusal relationship.
3. There must be normal axial inclinations of the teeth.
4. There must be a normal relationship of teeth to their respective jaw bones.
5. There must be normal relationship of the jaw bones to each other and to the skull.
6. Normal function of all associated parts must be established.

Herschel H. Reynolds is a graduate of University of Nebraska, School of Dentistry, Class of 1928. He practiced in Lexington, Nebraska, until 1934, at which time he joined the staff of the University of Detroit School of Dentistry as instructor in Orthodontics, where he now is associate in the conduction of the Orthodontic department.

He is an active member of the Michigan Society of Dentistry for Children, the local and state and national dental societies, and Xi Psi Phi fraternity.

Dr. Angle also sorted out cases of malocclusion and separated them into three classes. The first class is characterized by a normal mesial distal relationship of the jaws but individual teeth are not in proper alignment. The second class is characterized by a distal relationship of the mandible to the maxilla, and the third class by a mesial relationship of the mandible to the maxilla.

Next he provided mechanical means whereby these types of malocclusions could be changed to normal occlusion. So armed with these mechanical means which he said must be efficient, simple, delicate and inconspicuous, Dr. Angle set out to prove to the profession that he could achieve his objectives and still stay within the bounds of fundamental principles.

All this was happening around the turn of the century. Prior to this time Orthodontics was in a state of chaos, and was not considered a specialty. There were as many types of appliances and methods of treatment as there were men attempting to correct malocclusion. Teeth were being extracted wholesale without regard to future consequences. However there were some men (prominent among whom was Dr. Calvin S. Case) who, while objecting strenuously to the injudicious extraction of teeth to solve the problem of correcting malocclusion, believed that the extraction of the first bicuspids was necessary in some instances. Thus almost immediately after its conception one of Dr. Angle's basic principles (that there must be a full complement of teeth) was challenged. Despite these challenges he was able to prove

to the profession that he could correct malocclusion keeping a full complement of teeth and establishing a normal cusp and occlusal relationship of the teeth. However it was necessary for him to sacrifice simplicity, delicacy and inconspiciousness in his appliances.

Thus the science of Orthodontics was born. But as is the experience of all lusty overconfident children, trouble lay ahead. Cases of malocclusion which had been corrected began returning to their former state or to some condition other than normal occlusion. Also the faces of individuals who had undergone treatment seemed to be too far forward in relation to the skull. It was hoped that the teeth functioning in normal occlusion would in time produce harmony in form, thus fulfilling that part of the principle which says there must be normal relationship of the teeth to their respective jaw bones; there must be normal relationship of the jaw bones to each other and to the skull and that normal function of all associated parts must be established.

Thus the profession worried along, telling themselves and their patients that in time, satisfying conditions would be the result of their labors. The first waves of enthusiasm did not allow failures to be discussed openly. However a few men became extremely dissatisfied with the results obtained and began to study the fundamentals more closely. Also at about this time men appeared upon the scene who were studying how the face grows and conditions which affect this growth. This was a hopeful sign. The science of Orthodontics was reaching maturity.

Dr. George W. Grieve was one of the first men to question whether the establishing of normal occlusion was sufficient to insure harmonious results. He began to analyze malocclusion based upon the Forward Translation theory. This theory is found in the writings of J. Sim Wallace and states that the teeth have a tendency to drift mesially and finally find a position that is too far forward in relation to their basal bone. Dr. Grieve believed that harmony in facial appearance and permanence in result depended upon teeth being placed over basal bone during treatment. He believed this so firmly that he would extract the bicuspid teeth if there was no other way to accomplish it. His results were gratifying but most Orthodontists did not quite seem to understand what he was doing. It was not until ten years later, when another man brought forward the same theory, that the profession began to understand what was meant by positioning teeth over basal bone during treatment.

Now let us see what happens during the growth of the head and the face. Dr. Holly B. Broadbent has established a method of using standardized radiographs taken of the growing child at short intervals which reveals the pattern of facial growth and the early and incipient changes in the form and structure of the face. He uses a positioning device whereby the head of the child can always be oriented in the same position. The x-ray tube is also locked in position and the distance is always the same from the head of the child. Thus the amount of enlargement remains the same and the radiographs may be superimposed for comparative purposes. He has taken advantage of the relative stability of the base of the cranium to establish an area of least growth. Lateral view radiographs taken of the same individual at various times may be superimposed and related to these areas for comparison. This correlation of common landmarks in the skull which is outside the face proper allows measurements of changes occurring in the face itself in relation to these landmarks outside the face. By the use of this method and also by actual measurements, men have demonstrated that the face grows in the following manner:

In a general way the face grows in height, width and depth. Height growth is measured from the tip of the chin to the suture between the frontal and the two nasal bones. Width growth is measured directly across the palate from molar to molar. Depth growth is measured from the tip of the chin to the angle of the mandible.

CORRELATED FACIAL GROWTH

I. Birth to seven years. During this period the most intensive growth in height,

width and depth takes place and the primary dentition is completed.

1. Birth to seven months: The first period of rapid jaw growth. It takes place mainly in width and depth to accommodate the oncoming primary teeth. Very little height growth takes place at this time.

2. Seventh month to the end of the second year: There is growth in height as the primary teeth are erupting and the sinuses are growing. There is little growth in width and depth.

3. Third to the fourth year: Growth is taking place in all directions but mainly in height.

4. Fourth to the seventh year: Growth takes place mainly in depth. This is the second period of accelerated growth of the jaws as the first permanent molars are erupting.

II. Seven to fifteen years. During this period the primary dentition is shed and all of the permanent teeth with the exception of the third molars have been erupted.

1. Seventh to eleventh year: Growth in height and depth takes place. There is a downward and forward growth of the face. The permanent incisors are coming into occlusion and the second permanent molars are erupting.

2. From the twelfth to the sixteenth year: There is slight change.

III. From the fifteenth to the twentieth year: The eruption of the third molars takes place with corresponding need for more growth in depth. There is also a slight downward and forward adjustment of the face.

Thus far only direction of growth has been discussed but it is of great significance and interest to note that in the first five years of life, 78 per cent of height, 85 per cent of width and 82 per cent of depth growth has been achieved.

Also by the use of x-ray the development of occlusion has been greatly clarified.

At one month of age the teeth occupy the upper half of the lower jaw and the lower half of the upper jaw. In the lower jaw the teeth are in the body of the mandible below and anterior to the crypts of the first permanent molars which are located in the rami of the mandible above their junction with the body of the mandible.

At nine months the primary incisors are erupting and there is beginning calcification of the maxillary and mandibular central incisors and the mandibular lateral incisors.

At one year the first primary molars have erupted. There is beginning calcification of the permanent cuspids between the roots of the first primary molars.

At one and a half years the maxillary lateral incisors are beginning to calcify partially behind the maxillary centrals and below the maxillary cuspids. The crowns of the permanent cuspids have moved forward and are now mesial to the roots of the primary molars. At one year they were beginning to calcify between the roots of the primary molars.

At two and a half years the first bicuspids are beginning to calcify between the roots of the primary molars. It is of interest to note that these teeth begin calcification at the same site as the cuspids. The primary second molars are also erupting which completes the clinical pattern of the primary dentition.

At three years of age the crowns of the first permanent molars are completed. The mandibular first permanent molars have migrated forward from their original positions in the rami of the mandible into the body of the mandible. They then change their course to an upward direction in order that they may erupt into the mouth and meet the maxillary molars. The second bicuspid is beginning calcification between the roots of the second primary molar. There is also beginning calcification of the second permanent molars.

At five years of age the crowns of the permanent maxillary and mandibular central incisors and the mandibular lateral incisors are

complete and the resorption of the roots of the primary incisors is beginning to take place.

At six years of age the mixed dentition is in evidence with the twenty primary teeth in addition to the four first permanent molars. There is marked resorption of the roots of the primary central and lateral incisors. The permanent central and lateral incisors have migrated forward, outward and toward the occlusal plane.

At seven years the permanent mandibular central and lateral incisor and maxillary central incisors have erupted. The crowns of the permanent cuspids are completed but not yet erupted. The first permanent molars occlude end to end rather than in their characteristic occlusion.

At eight years of age the permanent incisors have erupted with the lateral incisor crowns flaring outward as they come downward and forward. The first permanent molars are in better occlusal relationship as the mandibular teeth have grown forward faster than the maxillary teeth with the faster growth of the mandible.

At nine years of age the permanent cuspids are moving forward outward and occlusalward at a faster rate than the growth of the jaws. The third molar germs are beginning to migrate from the rami into the body of the mandible.

At nine and one half years of age the maxillary first bicuspids are erupting and all of the permanent teeth including the third molars are undergoing calcification.

At ten and one half years of age all the first bicuspids and the maxillary second bicuspids have began to erupt.

At eleven years of age all the primary teeth with the exception of the mandibular second molars have been lost. The second permanent molars are erupting.

At twelve years of age all the primary teeth have been shed. The permanent molars, cuspids and bicuspids are undergoing adjustment to the normal adult occlusion.

At fourteen and a half years of age the second permanent molars have erupted.

At the age of sixteen all the teeth except the second permanent molars have completed their root formation and by the end of the sixteenth year the root ends of the second permanent molars have been closed.

By eighteen years of age room has become available for the third molars.

Of course there are normal variations but this is a comparatively accurate picture of the normal development of occlusion.

Growth from birth to adulthood is an orderly thing in the normal child. However this is not true in the child that has met with some misadventure in health. During illness or dietary upsets, growth may slow up or completely cease. When conditions are again normal growth becomes orderly but never quite reaches the maximum. This furnishes a clue in the etiology of malocclusion and has led many men to believe there is a discrepancy between the size of the teeth and their supporting structures.

It was Dr. Charles Tweed, working independently of Dr. Grieve, who again called to the attention of the profession that in the majority of cases of malocclusion there is a discrepancy between tooth size and supporting structure. From his mass of clinical evidence he has come to the following conclusions:

1. The attainment of normal occlusion as a result of orthodontic therapy is limited.

2. In normal occlusion the mandibular incisors are positioned upright over basal bone.

3. The ultimate in balance and facial aesthetics is achieved only when the mandibular incisors are so positioned.

4. Virtually all malocclusions are characterized by a forward drift of the teeth in relation to their basal bone. Owing to a lack of growth in the body of the mandible anterior to the rami there is often a discrepancy between tooth anatomy and osseous basal structure which makes it impossible for teeth an-

terior to the first molars to assume normal positions on basal bone. Such a discrepancy may occur even when the first permanent molars are normally positioned in relation to basal bone.

5. In the successful treatment of malocclusion, the mandibular incisors must be positioned in a normal relationship to their basal bone. So positioned they are in mechanical balance and best resist the forces of occlusion that will otherwise surely result in their displacement.

6. The normal relationship of the mandibular incisors to their basal bone is the most reliable guide in the diagnosis and treatment of all Class I, Class II and bimaxillary protrusion types of malocclusion, and to the attainment of the objective of balance and harmony of facial lines and permanence of tooth position. Such positioning of teeth often requires the removal of dental units.

7. By removing all four first bicuspids in the treatment of bimaxillary protrusion, it is possible to achieve five of the six requirements of normal occlusion. If they are retained the possibility of ever achieving more than two of the six is lost.

8. If the objectives of Orthodontic therapy are (1) permanence of tooth positioning or stability (2) healthy investing tissues that will insure longevity of denture (3) mechanically efficient masticating apparatus and (4) the best in facial aesthetics, then it is my opinion that it is necessary to remove dental units in all those cases where there exists a discrepancy between tooth substance and basal bone.

The profession is enthusiastic both in praise and condemnation. Individuals say the idea can be carried out in practice and are amassing evidence to prove it. Others say it compromises an ideal and that we do not as yet understand all the problems in correcting malocclusion. This disagreement is a hopeful sign. From the stimulated efforts of the profession the truth about the matter will arise.

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Can the Use of Souvenirs or Rewards be Justified?

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The question concerning the justification of souvenirs or rewards in the practice of dentistry for children should be a thought provoker for the practitioner of dentistry. The writer recalls a time while he was attending elementary school in Kansas when a certain dentist in a nearby town rewarded all the well behaved child patients with a quarter of a dollar and then made no charge for his services to the parent. Such a method of motivation and reward is one form of practice that no dentist could possibly conduct unless blessed with money, time and a very humanitarian spirit.

The use of rewards as a means of motivation is a time honored custom and its practice is seemingly increasing in popularity. According to Aretz[1], our whole scheme of living is based largely upon and permeated by a system of awards which are deeply associated with instinctive tendencies in the first consideration that thrusts itself upon us for recognition.

Young[2] thinks that rewards have a different effect upon children than upon adults. He states: "In children, innumerable rewards bestowed by parents and teachers serve at times to control behavior. A toy, a piece of candy, a gold star, a penny, the opportunity to play, permission to go to the circus, anything in fact which the child wants may function as a reward. With adults, money prizes and other material rewards, degrees, titles, honors, decorations, and numerous other social recognitions, act as spurs to achievement. Any end or object which is deliberately sought may function as a reward when held out as a goal or when bestowed either by an individual or by the social group"

Blatz and Bott[3], in defining a reward, state: "Rewards may be defined as a pleasing consequence attached to an act to facilitate its repetition. The fact that the reward is always tacked on to a situation means that the situation itself is tolerated only for the sake of what comes after. . . ."

From these two references, it seems that rewards were probably first used in dentistry because they helped to control behavior and the situation was tolerated better if a reward was promised for good behavior.

While searching for the viewpoints of others concerning rewards as a motivation for children, especially of those persons in the field of education, it was found that some believe that rewards have a very definite place in child management, while others consider the use of rewards a poor practice.

Blatz and Bott[3] think that rewards are temporary at best in their effects because they will speed up a performance for a short period, but will soon be forgotten and will introduce the objectionable element of barter into the dealing of parent and child.

In discussing the philosophy of awards, Aretz[1] states that some children who could only be reached through tangible means or bribes might not be reached at all if awards were eliminated. For these children, he thinks that we are safe in concluding that it is better to have reached them through a poor appeal than not to have reached them at all. He recognizes awards simply as substitutes for honest stimuli to interests of intrinsic worth and thinks that the extensive use of rewards is to be wholeheartedly condemned because

of its ultimate deleterious effects upon children.

Skinner and Harriman[4] agree that the whole pattern of rewards at home and in school needs careful study and revision. The child who is constantly motivated by rewards dependent upon the arbitrary dispensations of other persons often learns to lie, cheat, deceive, and flatter to receive rewards and learns to shirk when rewards are absent. Payment by parents for work done at home may help the home to run smoothly, but it is not uncommonly associated with lying, cheating, apple polishing," and demanding special favors.

From the foregoing thoughts one might conclude that rewards are not justified. However, after experimental work, Hamilton[5] concludes that definite knowledge, when given in the absence of the reward or punishment attitude, did not effect as much improvement as either of these attitudes when given without knowledge.

Thorndyke[6], in discussing the influence of irrelevant rewards states: "A satisfying after effect strengthens somewhat the connection to which it is attached, even though it is irrelevant to the purpose in the interest of which the connection was made and highly incongruous with the cravings and expectations of the person at the time." This statement would seem, however, besides applying to rewards, to apply also to souvenirs or gifts given by the dentist as a means of leaving a pleasant memory in the child's mind rather than as a reward for good behavior only.

From the reasoning for and against the use of rewards, *it seems logical to conclude that the practice of rewarding good behavior in the dental office is not justified.*

Souvenirs have become more and more popular and are employed by many dentists in the practice of dentistry for children. They should be given more as a keepsake, as we would give a treat or a purely free gift, or as something we do for children because we enjoy them and take pleasure in sharing their enjoyment. These souvenirs should be given freely without conditions of good behavior attached to them.

Since fear is often outweighed by curiosity, Pelton[7] thinks that it can be lessened by repeated contacts ending in a pleasant surprise in the form of a souvenir. He gives his juvenile patients a gift to help make the dental service pleasant and the dental office a place where interesting things happen. Some of the gifts he suggests as most popular for your patients are plaster figures of the Disney characters popularized in the animated cartoons of "Snow White and the Seven Dwarfs" and those from the story of Pinocchio, comic strip characters and many others. Educational models can also be used. Dolls and boats constructed in the dental office aid in making friendships with the shy and apprehensive child.[8]

This type of gift seems to be justifiable. In writing of her experimental work, Jones[9] states: "In our study of methods for removing fear responses, we have found unqualified success with only two. By the method of direct conditioning, we associated the fear object with a craving object, and replaced the fear with a positive response. By the method of social imitation we allowed the subject to share under conditions, the social activities of a group of children especially chosen with a view to prestige effect." The first method, where the fear object was associated with a craving object, would seem to apply to the use of gifts or souvenirs.

The use of souvenirs may further be justified since it has been shown by Jersild[10] that children include toys to such a degree in their likes, wishes and memories that the dentist may well consider the presentation of a gift as a treasured object and an important event to the child.

It would be amiss if the use of chewing gum and candy as gifts was not mentioned. These objects definitely make undesirable gifts or remembrances since much evidence points to the fact that in most children the consumption of sugar results in high saliva Lactobacillus acidophilus counts and proportionately high dental caries activity.[11-12]

CONCLUSIONS

The discussion presented leads to only one conclusion in the mind of the writer. Rewards are not justified in the practice of dentistry for children, but the use of souvenirs as treats or gifts may be justified since the following advantages may be gained through their use:

1. Souvenirs are capable of arousing positive pleasant reactions.

2. They also serve as a possible measure of assuring a satisfying after-effect following the dental appointment.

3. Souvenirs help to eliminate fear responses.

4. Since souvenirs make a visit to the dental office more exciting, the child may anticipate the visit with pleasure rather than anxiety and may consider the visit an important event.

5. Most children consider souvenirs treasured gifts.

6. Souvenirs may serve as practice builders.

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Q.—Do orthodontic appliances cause the teeth to decay?

A.—"Practically every orthodontic appliance requires the placing of bands on teeth. This procedure, if skillfully done, does not damage the tooth, and has been shown, in the case of rampant caries, to be an actual protection to the enamel surface. If the band is improperly placed and cement is washed from under the margin of the band, there is an immediate hazard which may produce a serious carious lesion. Bands should be carefully made, accurately adapted and cemented, and tested at regular intervals. In the mouths of immune persons, the accumulation of debris apparently has no effect, but in the 70% or more patients who are not immune to dental caries, careful attention to oral hygiene is an important factor in reduction of etching on the smooth tooth surfaces. Tooth decay during orthodontic treatment is in direct proportion to the susceptibility of the individual to dental caries, the skill and care in construction and use of orthodontic mechanisms, and the care of the patient in exercising hygienic measures."

R.—Noyes, H. J. Dental caries and the orthodontic patient. (p. 1251-3.)

ANNOUNCEMENT

Emory University School of Dentistry (formerly Atlanta-Southern Dental College) announces the appointment of Vincent M. Johnson, A.B., D.D.S., as Professor of Dentistry for Children and Director of the DeLos L. Hill, Jr., Memorial Dental Clinic for Children, established by the contributions of Mrs. DeLos L. Hill and the will of the late Dr. DeLos L. Hill, formerly a member of the faculty and the board of trustees of Atlanta-Southern Dental College.

Dr. Johnson is a graduate of Northwestern University Dental School, Class of 1941, and taught at his Alma Mater from that time until September, 1944. He is a member of Delta Sigma Delta.

Post Graduate Refresher Course in Children's Dentistry

The School of Dentistry of the College of Physicians and Surgeons at San Francisco, California, under the direction of Charles A. Sweet, prominent A.S.D.C. member, conducted a six-day refresher course in Dentistry for Children during the month of October, 1944.

The course was well attended and received by many California members, and included demonstrations in Radiography, Cavity Preparation, Anesthesia, Extraction, and Management of Fractured Anterior Teeth, as well as lectures in Anatomy and Morphology of Primary Teeth, Child Management, Oral Pathology, and the role of Pediatrics in Dentistry for Children.

Q.—What is the significance of mamelons on newly erupted centrals?

A.—"Each labial lobe terminates incisally in a rounded eminence which is known as a mamelon. Mamelons may be seen only at the time of eruption because soon after they are worn down by mastication. In rare instances when a tooth is out of alignment with the normal arch so that it receives no direct stress in mastication, mamelons may still be observed in adult life. The mamelons probably aid the process of eruption in that they cut out their way more readily through the gingiva. Soon after eruption, their usefulness having been served, the mamelons are worn away by the stress of mastication, leaving an even sharp margin which is better suited to the specialized function of mastication."

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